Conditional generative diffusion models with efficient sequential Monte Carlo

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1 Background

Generative diffusion models are recently successful methods for many applications (e.g., image generation). Therein, an important question is conditional generative sampling, for instance, given a corrupted image, to restore the original image. To solve this problem, many methods have been developed recently, in particular, the ones based on sequential Monte Carlo (SMC). **In this project, we work on developing new SMC-based conditional generative samplers by improving their proposal distributions.**

2 Learning outcomes

You will substantially learn new knowledge in statistical machine learning as well as practical skills:

- Generative diffusion models, a trending research topic in machine learning.

- Sequential Monte Carlo, a fundamental class of methods in statistics.

- JAX, a Python library for high-performance and differentiable computation.

3 Reading list

Zheng Zhao, Ziwei Luo, Jens Sjölund, and Thomas B. Schön. Conditional sampling within generative diffusion models. *arxiv:2409.09650*, 2024.

4 Eligibility requirements

- Strong background in statistical machine learning is a mandate. Preferably the candidate also has a good skill of training neural networks.

- The student has a research vision, and is willing to summarise and present the results to an international conference.

5 Contact

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